

Global Soundscapes: Open-Source Audio Mapping Tools for Promoting Freedom of Expression

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Abstract

This paper explores the development of open-source audio mapping tools designed to enhance freedom of expression and cultural representation worldwide. It examines the role of decentralized and accessible platforms in preserving soundscapes, archiving historical audio environments, and enabling civic engagement in societies with restricted media access.

1 Introduction

Freedom of expression is a fundamental human right, yet access to unbiased, uncensored, and regionally relevant media remains a challenge in many parts of the world. This study investigates how open-source audio mapping tools can democratize access to cultural and journalistic expression through decentralized, user-driven contributions.

2 Background and Related Work

2.1 The Role of Soundscapes in Cultural Identity

Audio environments play a crucial role in preserving historical and cultural narratives. Various projects, such as www.gnomeradio.org and www.garagejam.org, have demonstrated how localized soundscapes contribute to a shared human heritage.

2.2 Existing Open-Source Audio Mapping Projects

Several initiatives exist in the realm of open-source audio mapping, including www.perceptron.stream¹ and OpenStreetMap's audio layer. However, these projects face challenges related to data privacy, accessibility, and long-term sustainability.

3 Methodology

The research methodology involves:

- Literature review of existing audio mapping frameworks
- Development of a prototype using open-source GIS and WebRTC technologies
- User testing in communities with restricted media access
- Analysis of ethical and legal implications in different regulatory contexts

¹<https://perceptron.stream>

4 System Architecture

4.1 Data Collection and Storage

The system employs decentralized storage methods, such as IPFS, to ensure accessibility without reliance on centralized servers.

4.2 Audio Processing and Metadata

Captured audio is processed using the GStreamer framework, applying noise reduction and geographic metadata tagging.

5 Implementation

The prototype consists of:

- A mobile app for recording and submitting geotagged audio
- A web-based interactive map for exploration
- A backend API for metadata indexing and search functionality

6 Ethical and Legal Considerations

6.1 User Privacy

To protect user anonymity, all uploaded audio undergoes anonymization techniques before public indexing.

6.2 Regulatory Compliance

Different countries have varying laws regarding audio recording in public spaces. The project ensures compliance by implementing jurisdiction-based filtering mechanisms.

7 Results and Discussion

Preliminary testing in controlled environments shows promising results in terms of:

- Community engagement through participatory mapping
- Preservation of endangered languages via audio submissions
- Increased accessibility of local audio narratives

8 Conclusion and Future Work

The project provides a foundation for a decentralized, censorship-resistant audio mapping system. Future work includes improving AI-based transcription for linguistic diversity and expanding usability for low-bandwidth environments.

References